

30 JAN 1970

MEMORANDUM

SUBJECT: Notes on Cardiology - School Aviation Medicine
Col. Tim CARIS - RT. Bundle Branch Block

1957 Air Force started doing EKG's on everyone. Have done about 100,000. Found large number of BBB. Air Force decided arbitrarily that under forty (40) with no other findings they would continue flying. Concluded that over forty (40), they probably had arteriosclerotic changes and were grounded.

Sixty-eight (68) cases were selected which displayed normal EKG's shifting to BBB. Only eight (8) of these had any indication of heart disease. Of the remaining sixty (60), followups were done which averaged four (4) years after diagnosis, and showed one of the sixty (60) to have a diagnosis of "probable angina"; the remaining fifty-nine (59) had no symptoms.

Ninety-Six (96) hearts from consecutive aircraft accidents 76% showed some arteriosclerosis. Average age - 35-49. Fifty-five (55) of these subjects had some control of aircraft. In forty-five (45) of these accidents, good reasons were found to account for the accident.

In nine (9) of these accidents, it was possible that heart failure was a cause.

USAF review(s) completed.

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In Framingham, Massachusetts, 5,200 normal people were studied for seven (7) years. Fifteen (15) had infarcts with no previous history or any findings. Eight (8) of the fifteen (15) had absolutely no symptoms.

In World War II four hundred (400) coronaries occurred in a group whose age ranged from 18 to 39. Only 50% of these had prior symptoms. Therefore, history is not adequate in diagnosing heart disease. Physical exams are likewise not of much assistance.

Based upon above series, it is obvious that an annual EKG is a must in the Air Force.

Despite annual EKG, it has been found that a man can have a coronary and have an EKG, return to normal by time of next annual examination. Although they do have minor changes which reveal the past coronary attack. These are generally picked up by Vector - cardiography.

Masters Test - 1929 - Double Masters was started in 1942. It was thought to be very important because 95% of patients with Arteriosclerotic Heart Disease showed changes in EKG. However, it was then found out that 50% of normal people showed same changes. It was than later found that in patients with angina, the only definite changes in EKG were:

1. Depression S.T. Segment
2. Straightening of S.T. Segment

which than made it possible to pick out 70% of people with heart disease and have only 4% of normals showing some change.

MATTINGLY took 300 normal Army Officers using above criteria and found only six (6) came out with normal response. Over a period of seven (7) years follow-up, three (3) of these showed arteriosclerotic changes.

BRODY studied 700 normal males - age group 45-70 and had 23 positive responses. Sixteen (16) of these developed overt coronary disease (69%) as contrasted with a group of untested normal males of which 4% developed coronary disease.

In another series studied, those receiving Double Masters, it was found that those with positive changes will develop ten times as many with eventual coronary changes as found in those showing normal response.

To be kept in mind -- In England, college students were studied after "Flu" attacks and many were found to have a positive response which only lasted about three (3) months. Therefore, it is very important to emphasize "Flu" attacks in history.

In females who are hyper-ventilating, positive changes have been found.

70% of patients with known infarcts or angina will get 0.5 depression of S.T. segment with flattening and prolongation. Only 4% of normal people will get this on Double Masters test

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-- of this 4%, half will get overt artery disease in seven (7) years.

Therefore, those who have positive Masters test 20 times more than normal will get arterial disease in five years.

Surgeon General's Office of Air Force only last year has allowed double Masters to become part of annual physical.

Other factors causing these S.T. changes:

1. Hypokalemia
2. Digitalis
3. Increased diastolic pressure
4. Young people recovering from viral infections.
5. Some neurotics with hyperventilation but these changes will not occur when they are not hyperventilating.

EKG -

School of Aviation Medicine started a repository in 1957. Over 500,000 EKG's are on file. Receive 8,000 new tracings per month. Have 10,000 cases where there is 10-year follow-up on normal individuals.

Four (4) Groups of Tracings are filed at SAM.

1. Flying applicants
2. Air Force Academy students
3. Rated flying Officers from age 35 on - if no record prior to age 35.
4. Equivocal tracings with a substantial difference.

Upon EKG arrival at SAM, it is interpreted and codified

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and then placed on microfilm.

Normal Variants -

Definition: Sufficiently common not to be considered significant. Do NOT require waiver or further study.

Two (2) Categories:

Category I

Thirty-Six (36) of these - Sinus tachycardia, wandering atrial pacemakers, premature ventricular rhythm, parasystolic sounds, under 30, left axis deviation, early polarization, etc.

Category II

a. First degree Heart block -

Required to have Double Masters, Fasting EKG

b. Protracted "R" Wave

Get Double Masters and Vectorogram

c. Small Q Waves in AVF lead -

If a recent change

d. WPW (Wolfe - Parker - White) syndrome

Disqualify new pilot candidates

O.K. to fly already trained pilots unless associated with parasystolic tachycardia or other finds.

Treadmill

Answers question of what effect will larger amount of exercise have in assisting in diagnosis.

Treadmill action set to 3.3 miles per hour at a 15% grade. Patients have continuous EKG.

In 3,000 normal people age 20-45, only 1-5% will give positive findings.

Of those with known arteriosclerotic heart disease, 100% will give positive response on treadmill.

Patients with changes on Double Masters but no symptoms -- 100% will show up on treadmill.

Subjects with symptoms but no EKG changes -- 70% will be shown changes on treadmill

Exercising normal people on treadmill to exhaustion will not show EKG changes.

You will get 3 to 4 times as many positive tests if using maximal degree of exercise.

Conditions for doing safe maximal exercise test safely:

1. Medical monitoring at all times
2. Avoid an acute cardiac process

Maximal Testing

Treadmill running at 3.3 mi/hr. Gradually increase increase degree of climb. Indications for stopping procedure:

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1. Exhaustion
2. Systolic BP 260
3. Diastolic BP 140
4. Angina Pectoris
5. Significant arrhythmias
6. Leg cramps
7. Ventricular tachycardia (absolute reason)

Coronary Arteriography

Probably will be of big dianostic assistance in the future.

Cleveland Clinic has performed 13,000 arteriograms with only six (6) deaths. Have to consider they are doing these on sick patients and post-operative cases as well as diagnostic workups.

At SAM, necessary to have on Bundle Branch Block before being able to qualify patient for flying.

Cini Arteriography

Not using at SAM routinely as yet. This ia being done routinely at Lovelace Clinic.

Hypertension

"Sustained diastolic pressure"

Do not see severe hypertension at School of Aviation Medicine as these patients as pilots are by regulation

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disqualified when found by local Flight Surgeon. Not
get to SAM to be evaluated.

Air Force Regulations; highest permissionable pressures
for flying status:

140-90 to age 35

150-90 to age 35-45

154-94 over age 45

Biggest problem is relatively low level diastolic pressures.
Insurance statistics show pressures 90-100 have 2 - 3 times
more severe outcomes. Mortality rate varies in direct pro-
portion to Blood Pressure.

Heinz studied 1,500 patients for 10 to 15 years. Found
that if initial diastolic pressure is 85 or more, much more
likely to develop hypertension. Those with 95 or more,
46% developed sustained hypertension.

under 84	- 5.6%)
)
to 94	30%) Developed severe hypertension over 95
		later
	46%)

Clinical Division at SAM believes everyone with Hypertension
should have very thorough workup to:

1. Determine secondary causes
2. Rule out damage to target areas

If secondary cause found, man is only grounded temporarily.
He is treated and re-evaluated.

If target areas are identified - should not fly

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Three General Groups

1. Patient with no target areas -- Diastolic repeatedly over 100. Result of taking blood pressure every 15 minutes for three (3) hours. Felt he has organic hypertension and should be treated.

2. Diastolic 90 - 100 -- Occasionally normal. Felt he has definite diagnosis of hypertension but nothing would be expected to happen in next few years.

If he is obese and in poor condition, he is placed on waiver and reexamined in one year. If on reexamination dia stolic was over 100, he is grounded.

3. Labile Hypertension -

"Vascular Reactor" term often applied to young man in Service who is afraid of doctor. In Air Force, if you get one diastolic pressure under 90, he is submitted on this basis. Should have complete workup. If any indications of

Cardiac enlargement

Ischemia

Neurological or electro encephalological changes

Renal changes

believed he should have treatment which would call for grounding because of medication

In case with no organic findings - (Ray Gifford at Cleveland Clinic states that longevity is improved by having patient on medication before secondary findings or target

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organ identified). Should therefore consider patient. Policy is to give him trial on low salt diet, weight reduction, and physical conditioning, plus putting on waiver. Evaluate again in one year.

Severe Hypertension have -

1. Increased blood volume
2. Increased heart output
3. Peripheral resistance - up

In mild fixed hypertension or one type of labile hypertension -

1. Blood volume - normal
2. Cardiac Output - normal
3. Peripheral resistance - up

However, another type of labile reactors

Volume - up
Output - up
Resistance - Normal

Therefore, two (2) types of Labile Hypertension

Findings with use of Treadmill

Normal people - Systolic Pressure goes up
Diastolic - remains normal

Labile Hypertensions

Again two (2) types - in one group
Diastolic - Pressure goes up and another group where

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it remains stationary.

Hypertension - Diastolic is always elevated.

Of interest is diagram showing percentages of medical rejections from Air Training Command Center at Randolph Field. These are Officer Candidates who have been previously examined at recruitment centers around the country. This is for 1968.

4,000 Candidates

Total attrition 969 or 24%

Medical Attrition 151 or 3.7%